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(71) Applicant: **DANIELI & C. OFFICINE  
MECCANICHE S.p.A.**  
Via Nazionale, 19  
I-33042 Buttrio (UD)(IT)

Applicant: **DANIELI NATISONE Spa**  
Via Beltrame  
I-33042 Buttrio (UD)(IT)

(72) Inventor: **Moras, Paolo**  
Via Monte Hermada 49  
I-33100 Udine(IT)

(74) Representative: **Petraz, Gilberto Luigi**  
GLP S.r.l. Piazzale Cavedalis 6/2  
I-33100 Udine(IT)

(54) Continuous drawing method for straight drawing operations and device that employs the method.

(57) Continuous drawing method and device (10) straight drawing operations, whereby the drawing is carried out with a pair of tracked or chain means (12-112) that bear drawing clamps (15-115), the tracked or chain means (12-112) comprising means (17-18-19) to adjust the distance between centres of the tracked or chain means (12-112) in relation to a drawing axis (13) so as to adapt that distance to the various drawing diameters, the adjustment of the distance between centres of the tracked or chain means (12-112) and the final clamping of the material being drawn between the drawing clamps (15-115) taking place in at least two working steps, the first of these at least two steps providing for the approach of the tracked or chain means (12-112) to the drawing axis (13) with substantially mechanical methods and advantageously bringing one of the two tracked or chain means (12-112) to its final drawing position, whereas the other tracked or chain means (12-112) is halted at a position separated by a desired amount from its final position, while the second of at least two steps arranges for the final positioning of that other tracked or chain means (12-112) by means of an actuation with a fluid.

The device (10) comprising the following working units:

- first displacement means (21-121) connected to the means (17-18-19) that adjust the distance between centres,
- second displacement means (22-122) slidably coupled to the first displacement means (21-121) and connected to their respective tracked or chain means (12-112), and
- a chamber (23) to hold fluid, which is positioned between the first (21-121) and second (22-122) displacement means and can be filled momentarily with fluid under pressure.

**"CONTINUOUS DRAWING METHOD FOR STRAIGHT DRAWING OPERATIONS AND DEVICE THAT EMPLOYS THE METHOD"**

This invention concerns a continuous drawing method for straight drawing operations and also a device that employs such method. To be more exact, the invention concerns a method and a device by which the means that hold the drawing clamps and carry out re-circulation of those clamps in the drawing zone provide for adjustment of the distance between their centres in a plurality of separate steps.

The state of the art covers a plurality of continuous drawing methods and devices for straight drawing operations.

Drawbenches are known which employ trolleys moving to-and-fro in the drawing direction; it is well known that these trolleys are troubled by dynamic problems since it is necessary to invert their motion regularly at each engagement and release of the material drawn by the clamps with which the trolleys are fitted. This gives rise to considerable stresses on the moving parts and to problems of guiding and controlling the moving parts. Moreover, the greatest drawback of these embodiments lies in their inability to reach high speeds.

With a view to achieving high speeds the state of the art has provided embodiments having the purpose of obtaining a continuous drawing action on the material being drawn by means of continuous movement of the drawing clamps.

According to the state of the art such clamps are positioned facing each other and parallel along a straight segment and are borne on a pair of tracked means or chains.

Along this straight segment the clamps, half of which are on one tracked means whereas the other half are on the other tracked means, firstly clamp the material and then draw it with a continuous action.

One type of known embodiment arranges that the clamps are borne and moved on the respective tracked means or chains and are secured thereto.

Another type of known embodiment provides for the tracked means or chains to be merely the means that support and re-circulate the clamps; the drawing of the clamps performing the drawing operation is carried out by appropriate drawing means, such as threaded means, separate from the chains or tracked means.

These known embodiments include means to adjust mechanically the distance between centres of the tracks so as to adapt that distance to the various drawing diameters. In general, the drawing axis remains constantly the same, while both the tracked means are displaced crosswise to the drawing axis to adjust the distance between cen-

tres of the tracks according to the changes in diameter of the drawn product to be obtained.

All the known embodiments entail the problem of imperfect clamping of the drawn product between the clamps; this clamping with its mechanical actuation is not strong enough to meet the considerable drawing stresses in question in an adequate manner.

The results are not very efficient drawing operations, imperfect product quality, mechanical wear and still further shortcomings.

The present applicants have studied, tested and obtained a method and a device suitable to overcome the problems of the state of the art.

The invention is set forth in the main claims, while the dependent claims describe various features of the invention.

The invention provides for the employment of known means in the drawing operation, the means being advantageously of a type including chains or tracks to support and draw the drawing clamps.

According to the invention the action of adjusting the distance between centres of the chains or tracks and the final clamping of the clamps on the material being drawn take place in at least two steps with different methods.

The first step is the approach of the chains or tracks to the drawing axis in a known manner by means of substantially mechanical operational means. In this first step one of the two chains or tracks reaches advantageously the final position it will occupy during the drawing operation, whereas the other chain or track is halted in a position near the drawing line but distanced therefrom by a required value.

In the second step, in which the product to be drawn is clamped between the clamps, the second chain or track is brought into cooperation with the first chain or track by a displacement caused by actuation by means of a fluid.

Both the chains or tracks may also be positioned at a distance from the drawing axis and then be displaced finally by actuation by means of a fluid, but this solution is more complex from a constructional and operational point of view.

The combined action of clamping mechanically and by a fluid has been found to be very efficient and gives an excellent performance even where great diameters are to be drawn. This great efficiency of performance enables drawing assemblies to be constructed with very modest dimensions even where great drawing stresses are involved.

The wear on the operational assemblies is also greatly lessened with resulting advantages.

The attached figures, which are given as a non-restrictive example, show the following:-

Fig. 1 gives a diagrammatic side view of a drawing device to which the method according to the invention can be applied;

Fig. 2 shows a detail of the drawing device that performs the method.

In Fig. 1 a continuous drawing device 10 which is substantially known in itself is positioned downstream of a drawbench 11. In this example the device 10 comprises two drawing chains 12-112 located on the same plane in the neighbourhood of a drawing axis 13.

The two chains 12-112 may lie on the same horizontal, vertical or inclined plane, depending on the choice of the design work.

The two chains 12-112 are wound on their respective sprockets 14; each chain comprises an opposed straight segment on the drawing axis 13.

Each chain 12-112 bears its respective halves of drawing clamps 15-115, which cooperate in forming complete clamps on the drawing axis 13.

Both the first halves 15 and the second halves 115 of the clamps are connected to their respective chains 12-112 by suitable connection means 16.

The device 10 is equipped with means to adjust the distance between centres of the chains 12-112. The adjustment of the distance between centres is required in the initial drawing step when it is necessary to be able to apply great displacements to the clamps 15-115 at a right angle to the drawing axis 13 so as to enable the operations of introduction and gripping of the material to be drawn to be carried out.

This adjustment of the distance between centres in a direction at a right angle to the drawing axis 13 is of a modest value but is also required to adapt the chains 12-112 to the variations in the diameters to be drawn.

The means for adjustment of the distance between centres comprise a motor 17 of a suitable type that actuates a pair of threaded shafts 19 through transmissions 19.

Each threaded shaft 19 comprises two threaded segments 20-120, one having a righthand thread and the other a lefthand thread, which cooperate with their own nut screw assemblies 21-121 (see Fig. 2). These nut screw assemblies 21-121 cooperate with sleeve assemblies 22-122 connected to the respective chains 12-112.

The sleeve assemblies 22-122 can slide in relation to the coordinated nut screw assemblies 21-121 and, when thrust by the latter 21-121 during rotation of the threaded shafts 19, are displaced.

According to the invention one chain 12 is brought, by means of the sleeve assembly 22 connected thereto, to a position orthogonally in relation to the drawing axis 13 by the motor 17; this

position is the final one to be taken up by that chain 12 according to the pre-selected diameter to be drawn.

The other chain 112 is brought at the same time by the other sleeve assembly 122 connected thereto in the opposite direction to that of the first chain 12 to a required position in relation to the drawing axis 13, but this position is not the final position and is distant by a required value from the drawing axis 13.

The final position of the second chain 112, namely the position for clamping between the two chains 12-112 the material to be drawn, is reached with a supplementary travel of the second sleeve assembly 122. This supplementary travel is obtained by the injection of fluid under pressure into a chamber 23 positioned between the second nut screw assembly 121 and the second sleeve assembly 122.

In this example the fluid under pressure causes the second sleeve assembly 122 to slide in relation to the second nut screw assembly 121 and the second chain 112 to be displaced downwards by a value which corresponds to the play 24 in the embodiment of Fig. 2.

Means 25 and 125 are included to eliminate the mechanical play proper to the system and, in particular, the play in the threaded segments 20-120 and nut screw assemblies 21-121.

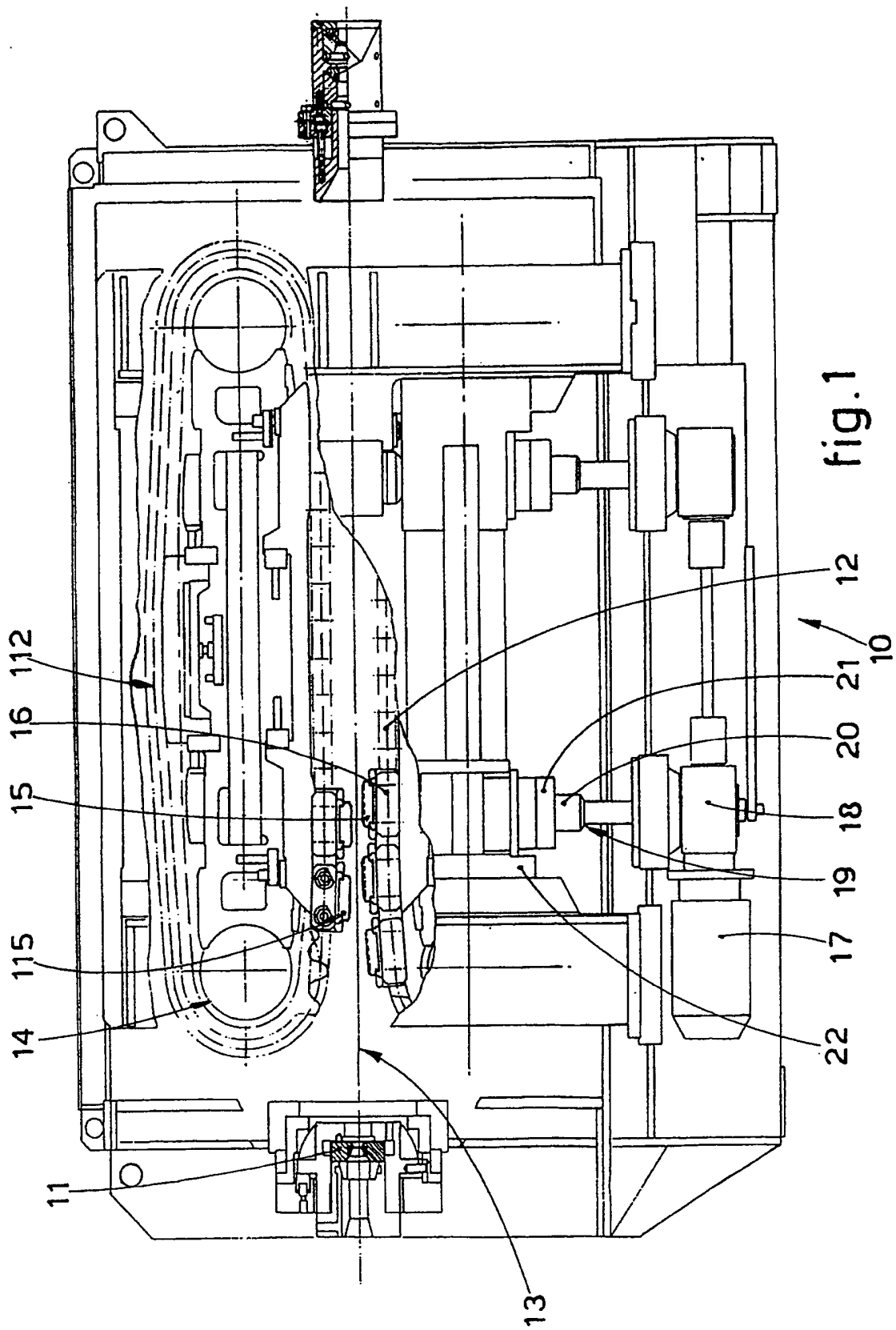
It is obvious that the functions of the chains 12 and 112 can be inverted. Other forms of embodiment of the various units of the invention can also be seen to be possible by a person skilled in this field without departing thereby from the scope of the invention as claimed.

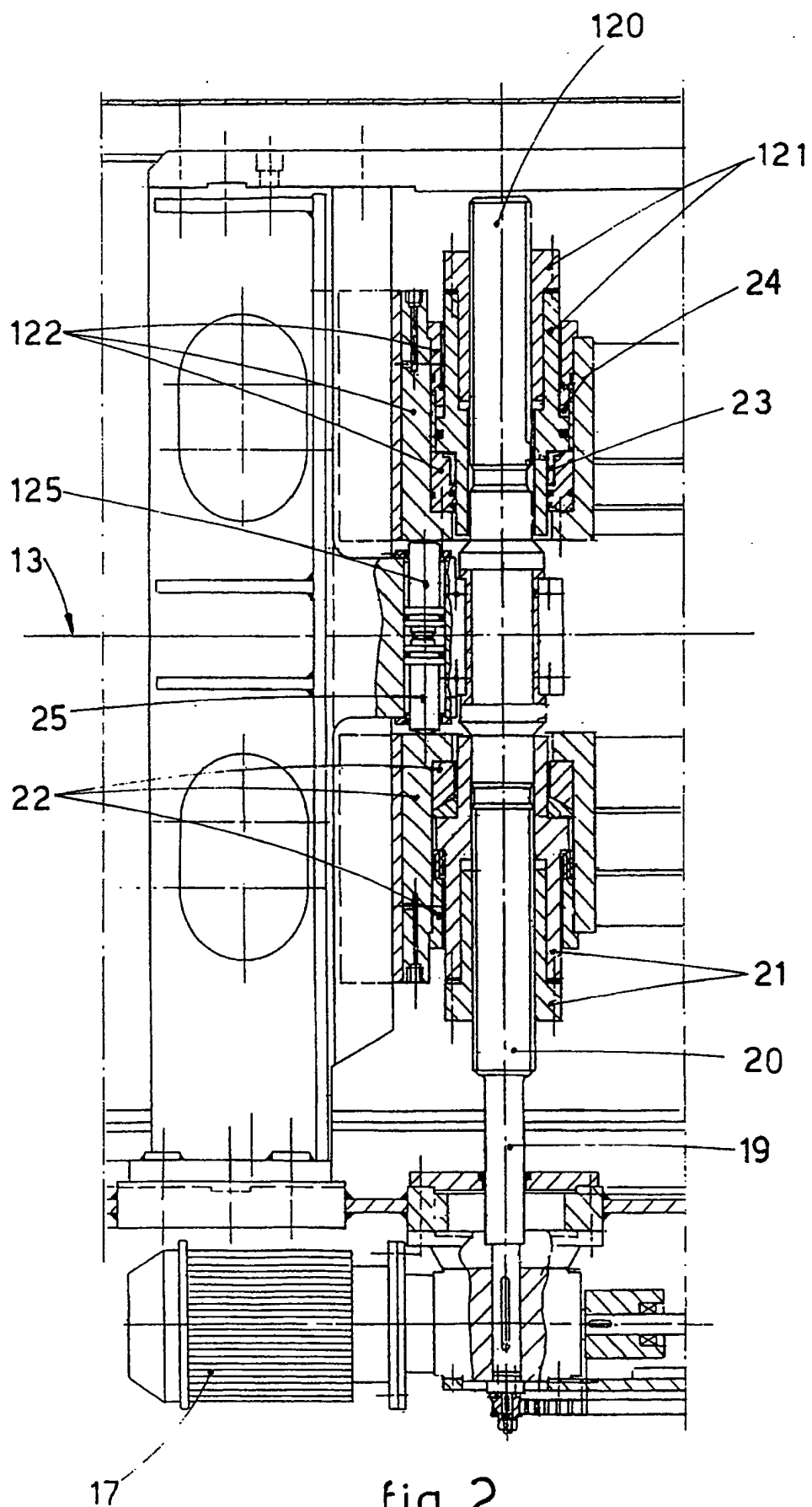
## Claims

1. Continuous drawing method for straight drawing operations, whereby the drawing is carried out with a pair of tracked or chain means (12-112) that bear drawing clamps (15-115), the tracked or chain means (12-112) comprising means (17-18-19) to adjust the distance between centres of the tracked or chain means (12-112) in relation to a drawing axis (13) so as to adapt that distance to the various drawing diameters, the method being characterized in that the adjustment of the distance between centres of the tracked or chain means (12-112) and the final clamping of the material being drawn between the drawing clamps (15-115) take place in at least two working steps, the first of these at least two steps providing for the approach of the tracked or chain means (12-112) to the drawing axis (13) with substantially mechanical methods and advantageously bringing one of the two tracked or chain means

(12-112) to its final drawing position, whereas the other tracked or chain means (12-112) is halted at a position separated by a desired amount from its final position, while the second of at least two steps arranges for the final positioning of that other tracked or chain means (12-112) by means of an actuation with a fluid. 5

2. Method as claimed in Claim 1, in which both the tracked or chain means (12-112) are halted at a position distanced from the drawing axis (13) in the first step. 10
3. Method as claimed in Claim 1 or 2, in which both the tracked or chain means (12-112) undergo final actuation by means of a fluid in the second step. 15
4. Continuous drawing device (10) for straight drawing operations, whereby the drawing is carried out by a pair of tracked or chain means (12-112) that bear drawing clamps (15-115), the tracked or chain means (12-112) comprising means (17-18-19) to adjust the distance between centres of the tracked or chain means (12-112) in relation to a drawing axis (13) so as to adapt that distance to the various drawing diameters, the device (10) employing the method of the claims hereinbefore and being characterized in that it comprises the following working units: 20  
- first displacement means (21-121) connected to the means (17-18-19) that adjust the distance between centres, 25  
- second displacement means (22-122) slidably coupled to the first displacement means (21-121) and connected to their respective tracked or chain means (12-112), and 30  
- a chamber (23) to hold fluid, which is positioned between the first (21-121) and second (22-122) displacement means and can be filled momentarily with fluid under pressure. 35  
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5. Device (10) as claimed in Claim 4, in which the chamber (23) to hold fluid is included in only one of the assemblies (121-122) that carry out displacement. 50
6. Device (10) as claimed in Claim 4 or 5, in which means (25-125) are included to eliminate mechanical play, in particular the play in the first displacement means (21-121) and in coordinated threaded segments (20-120). 55







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## EUROPEAN SEARCH REPORT

Application Number

EP 90 12 3300

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-2 797 798 (HALLDEN) * Column 4, line 38 - column 6, line 25; figures 3,5,7 * - - -	1,4,5	B 21 C 1/30
A	US-A-2 642 280 (FISK) * Column 4, line 13 - column 5, line 29; figures 1-3 * - - - - -	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 21 C B 65 G
The present search report has been drawn up for all claims			
Place of search	Date of completion of search	Examiner	
The Hague	01 March 91	THE K.H.	
<b>CATEGORY OF CITED DOCUMENTS</b> X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention		E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons ----- &: member of the same patent family, corresponding document	